```
  1  GCC TCT ACC CTC AAG TCT GGT TCT AAG GAA GTT GAG AAT CTC AAG AAG CCT TTC    54
  1   A   S   T   L   K   S   G   S   K   E   V   E   N   L   K   K   P   F    18

 55  ATG CCT CCT CGG GAG GTA CAT GTT CAG GTT ACC CAT TCT ATG CCA CCC CAA AAG   108
 19   M   P   P   R   E   V   H   V   Q   V   T   H   S   M   P   P   Q   K    36

109  ATT GAG ATC TTT AAA TCC CTA GAC AAT TGG GCT GAG GAG AAC ATT CTG GTT CAT  ·162
 37   I   E   I   F   K   S   L   D   N   W   A   E   E   N   I   L   V   H    54

163  CTG AAG CCA GTT GAG AAA TGT TGG CAA CCG CAG GAT TTT TTG CCA GAT CCC GCC   216
 55   L   K   P   V   E   K   C   W   Q   P   Q   D   F   L   P   D   P   A    72

217  TCT GAT GGA TTT GAT GAG CAA GTC AGG GAA CTC AGG GAG AGA GCA AAG GAG ATT   270
 73   S   D   G   F   D   E   Q   V   R   E   L   R   E   R   A   K   E   I    90

271  CCT GAT GAT TAT TTT GTT GTT TTG GTT GGA GAC ATG ATA ACG GAA GAA GCC CTT   324
 91   P   D   D   Y   F   V   V   L   V   G   D   M   I   T   E   E   A   L   108

325  CCC ACT TAT CAA ACA ATG CTG AAT ACC TTG GAT GGA GTT CGG GAT GAA ACA GGT   378
109   P   T   Y   Q   T   M   L   N   T   L   D   G   V   R   D   E   T   G   126

379  GCA AGT CCG ACG TCT TGG GCA ATT TGG ACA AGG GCA TGG ACT GCG GAA GAG AAT   432
127   A   S   P   T   S   W   A   I   W   T   R   A   W   T   A   E   E   N   144

433  AGA CAT GGT GAC CTC CTC AAT AAG TAT CTC TAC CTA TCT GGA CGA GTG GAC ATG   486
145   R   H   G   D   L   L   N   K   Y   L   Y   L   S   G   R   V   D   M   162

487  AGG CAA ATT GAG AAG ACA ATT CAA TAT TTG ATT GGT TCA GGA ATG GAT CCG CGG   540
163   R   Q   I   E   K   T   I   Q   Y   L   I   G   S   G   M   D   P   R   180

541  ACA GAA AAC AGT CCA TAC CTT GGG TTC ATC TAT ACA TCA TTC CAG GAA AGG GCA   594
181   T   E   N   S   P   Y   L   G   F   I   Y   T   S   F   Q   E   R   A   198

595  ACC TTC ATT TCT CAT GGG AAC ACT GCC CGA CAA GCC AAA GAG CAT GGA GAC ATA   648
199   T   F   I   S   H   G   N   T   A   R   Q   A   K   E   H   G   D   I   216

649  AAG TTG GCT CAA ATA TGT GGT ACA ATT GCT GCA GAT GAG AAG CGC CAT GAG ACA   702
217   K   L   A   Q   I   C   G   T   I   A   A   D   E   K   R   H   E   T   234

703  GCC TAC ACA AAG ATA GTG GAA AAA CTC TTT GAG ATT GAT CCT GAT GGT ACC GTT   756
235   A   Y   T   K   I   V   E   K   L   F   E   I   D   P   D   G   T   V   252

757  TTG GCT TTT GCT GAT ATG ATG AGA AAG AAA ATT TCT ATG CCT GCA CAC TTG ATG   810
253   L   A   F   A   D   M   M   R   K   K   I   S   M   P   A   H   L   M   270

811  TAT GAT GGC CGA GAT GAT AAT CTT TTT GAC CAC TTT TCA GCT GTT GCG CAG CGT   864
271   Y   D   G   R   D   D   N   L   F   D   H   F   S   A   V   A   Q   R   288

865  CTT GGA GTC TAC ACA GCA AAG GAT TAT GCA GAT ATA TTG GAG TTC TTG GTG GGC   918
289   L   G   V   Y   T   A   K   D   Y   A   D   I   L   E   F   L   V   G   306

919  AGA TGG AAG GTG GAT AAA CTA ACG GGC CTT TCA GCT GAG GGA CAA AAG GCT CAG   972
307   R   W   K   V   D   K   L   T   G   L   S   A   E   G   Q   K   A   Q   324

973  GAC TAT GTT TGT CGG TTA CCT CCA AGA ATT AGA AGG CTG GAA GAG AGA GCT CAA  1026
325   D   Y   V   C   R   L   P   P   R   I   R   R   L   E   E   R   A   Q   342

1027 GGA AGG GCA AAG GAA GCA CCC ACC ATG CCT TTC AGC TGG ATT TTC GAT AGG CAA  1080
343   G   R   A   K   E   A   P   T   M   P   F   S   W   I   F   D   R   Q   360

1081 GTG AAG CTG TAG                                                          1092
361   V   K   L   *
```

FIG. 1

117 full positional randomization
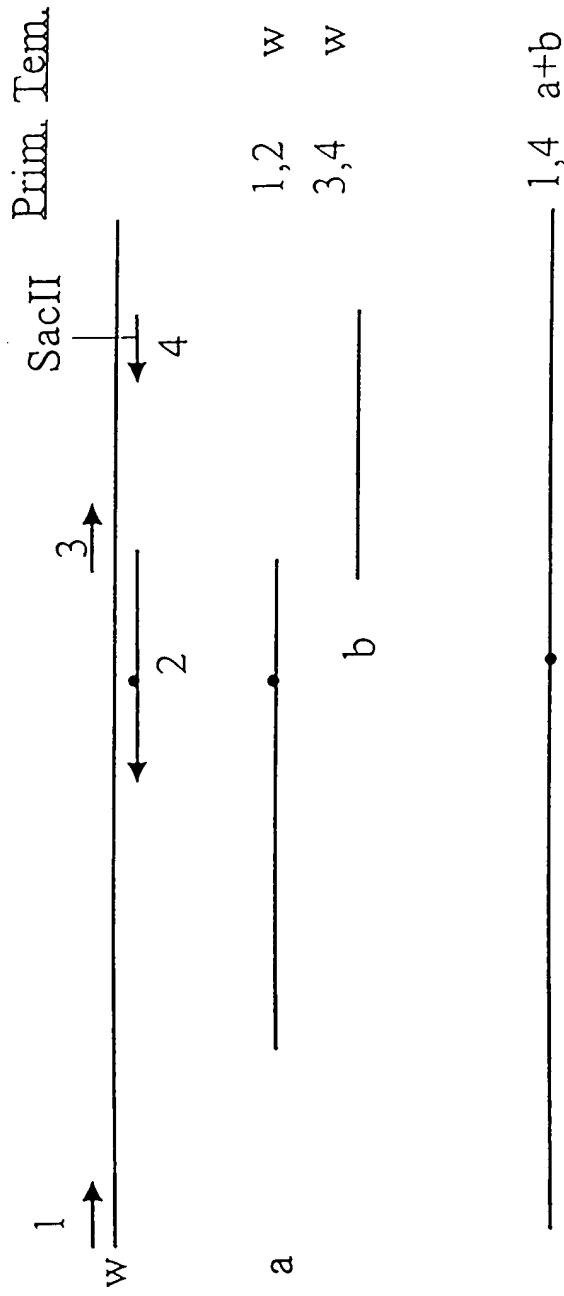
w is wt sequence
a, and b are fragments
• is NNK codon

FIG. 2

Making a combinatorial library with
full positional randomization

Prim Tem

1,2   w

3,4   w

5,6   w

1,6   a+b+c
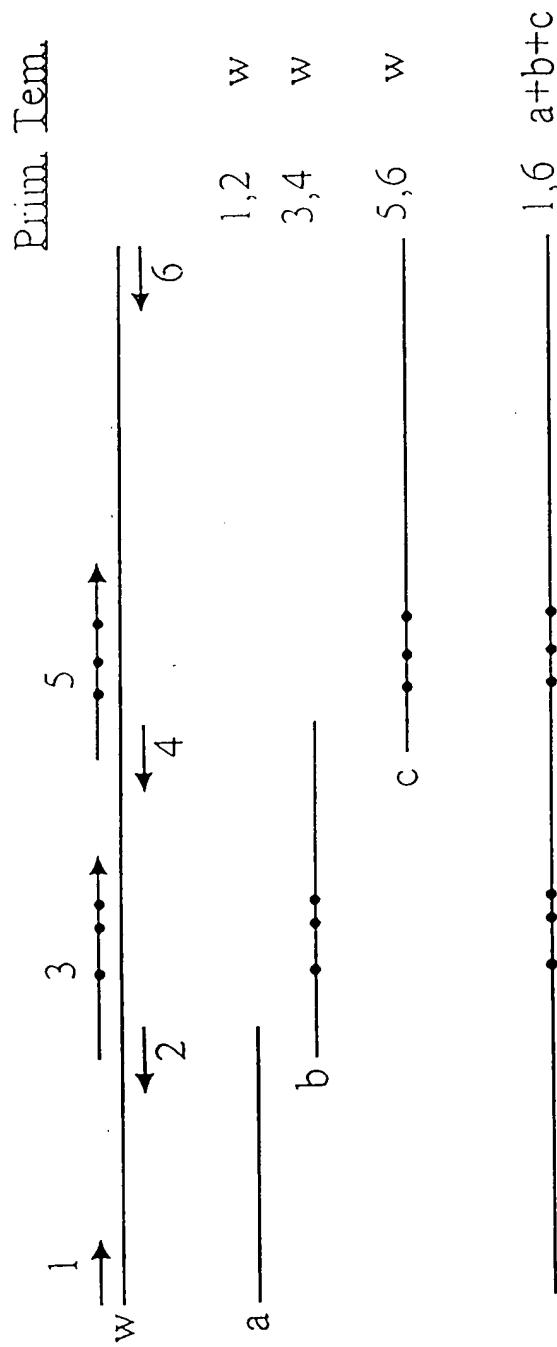
Prim. Is primer
Tem. Is template

w is wt sequence
a, b and c are fragments
• is NNK codon

FIG. 3